COMPARISON OF HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF COVID-19 PATIENTS IN ICU AND IN WARD

ABSTRACT

INTRODUCTION: Covid-19 is 65 nm to 125 nm in diameter and contains single-stranded RNA as nuclei content. Covid-19's global scale transmission, frequent occurrence, large number of deaths, infection and mortality among care providers, and multiplicative impact in vulnerable or sensitive groups are all major causes of concern. The clinical presentations of coronavirus disease are diverse, ranging from asymptomatic carriers to manifestations of respiratory collapse requiring mechanical ventilation and ICU support, as well as multi-organ and systemic symptoms such as sepsis, septic shock, and multiple organ dysfunction syndromes (MODS).

AIM: Comparison of Haematological and Biochemical Parameters of Covid-19 Patients in ICU and in Ward

MATERIAL AND METHODS: 25 patients were ICU and 25 patients were ward. Patients went directly to the Observed Treatment in the Dept. of Medicine and Dept. of Respiratory, Datta Meghe Medical College and Shalinitai Meghe Hospital and Research Centre,

RESULT: Serum urea and creatinine significantly raised in ICU patients as compare to ward patients while sodium, potassium and chloride were insignificantly increased in ICU patients. Table 1 shows the D-dimer was also increased in ICU patients (3.45±2.76) as compare to the ward patients (1.49±2.13). D-Dimer is significantly increased in ICU patients (P=0.0071). As we can see in above table the level of Pro-BNP were highly significantly raised in ICU patients as compare to the ward patients (P = 0.0001). While level of Trop T insignificantly increased in ICU patients (P=0.8732).

CONCLUSION: Several indicators, such as elevated leukocyte and CRP, LDH, and deranged urea/creatinine, were identified to be most likely correlated factors with disease incidence and mortality in our study. so are lower bicarbonate levels. However, acute liver and kidney injury are more common in COVID-19 patients.

KEYWORDS: Covid-19, SARS-CoV-2, RNA, NSAIDs, Haematological Parameters and WHO

INTRODUCTION

The coronavirus disease-2019 (COVID-19) epidemic first surfaced at the end of December in a Hunan seafood market in Wuhan, China, and was quickly proclaimed an international public health emergency by the World Health Organization.1

It's an infectious disease caused by the coronavirus-2 that causes extreme acute respiratory syndrome SARS-CoV-2 is phylogenetic ally related to SARS viruses, according to genomic studies, and bats may be the primary vector. While the virus's intermediate point of origin and spread to humans is unknown, it has been shown that it is capable of rapid human-to-human transmission. The virus was primarily transmitted from person to person by physical interaction. Coughing, sneezing, and laughing cause droplets. Cardiovascular damage,

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respiratory failure, acute respiratory distress syndrome, and even death may occur in severe situations.2,3

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Covid-19 is 65 nm to 125 nm in diameter and contains single-stranded RNA as nuclei content. Covid-19's global scale transmission, frequent occurrence, large number of deaths, infection and mortality among care providers, and multiplicative impact in vulnerable or sensitive groups are all major causes of concern.4

The clinical presentations of coronavirus disease are diverse, ranging from asymptomatic carriers to manifestations of respiratory collapse requiring mechanical ventilation and ICU support, as well as multi-organ and systemic symptoms such as sepsis, septic shock, and multiple organ dysfunction syndromes (MODS). 5

The mild type of coronavirus manifestations is observed by the majority of no or mild pneumonia manifestations, moderate and extreme with sepsis, severe pneumonia, and MODS, and severe with sepsis, heavy pneumonia, and MODS. Fever (98.6%), exhaustion (69.6%), dry cough (59.4%), stomach pain (34.8%), and dyspnea (31.2%) were the most often reported symptoms at the time of infection's occurrence, while headache (6.5%), dizziness (9.4%), stomach pain (2.2%), diarrhea (10.1%), nausea (10.1%), and vomiting were the least common (3.6 %). 6 Coronavirus, according to several surveys, mostly affects the elderly population, with hypertension (15%), diabetes (12%), cardiovascular diseases (10%), and cerebrovascular disorders (10%) becoming the more common comorbidities (7 %). 6,7

At 4 degrees Celsius, samples should be held. This saliva and mucus samples are processed using reverse transcription polymerase chain reaction (RT-PCR), which amplifies genetic information derived from the samples and detects and preserves CoV material.8

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Lymphocytopenia (82.3%), thrombocytopenia (36.2%), and leukopenia (33.7%) were seen in the majority of COVID-19 disease patients. The majority of patients had elevated levels of C-reactive protein (CRP), while high levels of alanine transaminase (ALT), aspartate aminotransferase (AST), creatinine kinase (CK), and D-dimer were less common. In the majority of patients, computed tomography scans (CT-Scan) reveal ground-glass opacity (65%), ill-defined margins (81%), smooth or irregular interlobular septal thickening (35%), air bronchogram (47%), wild paving pattern (10%), and thickening of adjacent pleura (32 %). Since there have been no conclusive antivirals or vaccines for novel coronavirus disease (COVID-19) in recent intervals, preventive treatment, which includes broad-spectrum antibiotics, antivirals, corticosteroids, oxygen therapy, artificial ventilation, and convalescent plasma, is a popular regimen in the present scenario. 9 The aim of the research was to explain both clinical and biochemical features of COVID-19 patients, as well as to identify markers that indicate a poor prognosis and mortality in COVID-19 patients.

In this study researcher focused on admission of patients, laboratory investigations with disease severity, and it is the first of its kind in this field, to our knowledge.10

AIM

Comparison of Haematological and Biochemical Parameters of Covid-19 Patients in ICU and in Ward

MATERIAL AND METHOD

The study conducted Department of Biochemistry this study included 50Covid positive patients of age 40 -55 years who were admitted in ICU and Ward to Shalinitai Meghe hospital and Research centre, consequently, 25 patients were ICU and 25 patients were ward.

Patients went directly to the Observed Treatment in the Dept. of Medicine and Dept. of Respiratory, DMMC and SMHRC, Nagpur[24].

SAMPLE COLLECTION

5ml of each patient's blood sample was taken and separated in two tubes EDTA and plain tube. The sample was used to estimate the levels of Liver function test, Ferritin, LDH, CRP and CBC.

BIOCHEMICAL ANALYSIS

EDTA samples were used for the CBC count was estimated on 3 parts coulter counter. The sample was used to estimate the levels of Liver function test, Renal function test, CRP, ferritin, LDH, Trop-I, D-dimer, Pro-BNP were estimated on AU480 Analyser.

RESULT

Table 1: Comparison between Biochemical and haematological parameters ICU and Ward Covid-19 positive patients

Parameters	ICU (n-25)	Ward (n-25)	P-valve
Hb (gm/dl)	11.20±3.1	14.2±2.60	P = 0.0005
WBC (%)	14001±46	9301±23	P < 0.0001
PLT (Laks/cumm)	140.13±21.0	212.10±34.7	P < 0.0001
Total Bilirubin (mg/dl)	0.43±0.24	1.54±1.41	P = 0.0003
Direct (mg/dl)	0.20±0.15	0.78±1.01	P = 0.0066
Indirect (mg/dl)	0.23±0.9	0.76±0.43	P = 0.0107
SGOT (IU/L)	97.65±32.0	56.31±23.0	P < 0.0001
SGPT (IU/L)	110.1±26.0	61.42±28.9	P < 0.0001
Total Protein (mg/dl)	6.61±3.24	6.18±1.34	P= 0.4403
Albumin (mg/dl)	3.80±2.85	3.24±1.27	P= 0.3465
Alkaline P (IU/L)	166.4±65.10	89.7±33.0	P < 0.0001
GGT (IU/L)	93.7±35.0	49.0±7.60	P < 0.0001
Urea (mg/dl)	54.30±29.91	28.40±12.69	P = 0.0002
Creatinine (mg/dl)	1.64±1.02	0.76±0.28	P = 0.0001
Sodium (mEq/L)	139.1±4.47	141.1±8.97	P = 0.3234
Potassium (mEq/L)	4.72±0.83	4.27±0.59	P = 0.0319
Chloride (mEq/L)	98.58±8.33	102.4±6.97	P = 0.0850
Bicarbonate (mEq/L)	17.5±4.84	19.24±3.37	P = 0.1467
D-dimer (mcg/mL)	3.45±2.76	1.49±2.13	P = 0.0071
LDH (IU/L)	487.41±34.0	241.0±36.0	P < 0.0001
CRP (mg/L)	57.0±9.2	21.0±4.5	P < 0.0001
Ferritin (ng/dl)	785.60±63.0	483.2±48.3	P < 0.0001
Trop-T (pg/mL)	106.01±43.7	103.92±61.0	P = 0.8732
Pro-BNP (pg/mL)	2641±597.0	1682.0±972.5	P = 0.0001

Comparison of HB, WBC and Platelets in ICU patients was raised and ward patients were normal.

Comparison of liver function tests parameters in the study groups. Total and direct serum bilirubin levels were increased in ICU patient's normal in ward patients. The primary liver enzymes ALT and AST were raised in the both ICU and ward patients. Between the ICU and ward were ALKP was within normal in ward patients but increased in ICU patients.

Serum Total Protein and Albumin levels were within normal limits in both ICU and ward the groups. The both groups differences were statistically not significant (P= 0.4403, P= 0.3465).
Comparison between ICU and ward serum LDH level were more than ICU patients to ward patients.
Comparison of serum Ferritin level is both ICU and ward patients are raised in both groups.
Comparison CRP level in both ICU and Ward patients more than ward patients CRP level are high in ICU patients.
However differences between the ICU and Ward liver function test, LDH ferritin and CRP patients were (P <0.0001) statistically significant Excepts total protein and albumin are not significant. (P= 0.4403, P= 0.3465)
Serum urea and creatinine significantly raised in ICU patients as compare to ward patients while sodium, potassium and chloride were insignificantly increased in ICU patients.
Table 1 shows the D-dimer was also increased in ICU patients (3.45±2.76) as compare to the ward patients (1.49±2.13). D-Dimer is significantly increased in ICU patients (P=0.0071).
As we can see in above table the level of Pro-BNP were highly significantly raised in ICU patients as compare to the ward patients (P = 0.0001). While level of Trop T insignificantly increased in ICU patients (P=0.8732).

DISCUSSION

Abnormal LFT is common in COVID-19, and it appears in combination with elevated heart and muscle enzymes. It returns to normal without affecting any liver-related morbidity or mortality. COVID-19Aminotransferase elevation may also be due to myositis, which is common in people who have had a lot of flu. 8 According to a recent study, SARS-CoV-2 is thought to bind directly to cholangiocytes, demonstrating the Angiotensin Converting Enzyme 2 (ACE) receptor and causing liver damage. 21 This clarifies how the SARSCoV-2 virus caused our patient's liver dysfunction.11
Patients with abnormal LFT results, particularly hepatocyte at the time or during the hospitalization, had higher risk of progression to sever than those with standard liver tests. Exacerbation of pneumonia to mild pneumonia is a crucial health result that suggests a higher mortality risk and necessitates admission to the intensive care unit (ICU) or mechanical ventilation. Previous research has established age, race, and underlying conditions as risk factors for extremeCOVID-19. This is one of the first studies to show a correlation between pathological liver testing and severe disease. Our results support the hypothesis that the SARS-CoV-2 virus is not only highly transmissible but also capable of inducing severe multi-organ dysfunction in humans.12,13
Lymphocytopenia, leukopenia, thrombocytopenia, deranged liver function enzyme levels, elevated CRP, and D-dimers were observed in our sample population, which corresponded to the findings of multiple studies. 14
In our research, hemoglobin levels in patients with COVID-19 admitted to the wards and those who survived were marginally different (Increased) from patients admitted to intensive care units (ICU) and those who died, which corresponded to results from minimal studies.15
Renal parameter creatinine was found to be within normal ranges in patients admitted to wards with moderate disease or patients who survived, but dramatically elevated creatinine was found in patients admitted to ICU and those who died, according to our findings, which

are compatible with numerous reports. The sodium levels in our sample size of patients were shown to be within normal limits in moderate vs. mild cases non-serious, in comparison to another study that found a drop in sodium levels in patients admitted to intensive care units, contradicting our results, even though severe patients in our study developed significantly elevated sodium levels during their hospital stay (Figure (Figure4e)4e). Potassium levels were shown to be elevated but within normal range in ICU and deceased patients as compared to those admitted to the ward or recovered, a result that matched that of another study. In our sample, patients in intensive care units and the deceased had higher urea and chloride levels, as well as lower serum bicarbonate levels, which correlated with the results of negligible tests.16,17

Patients in intensive care units and others who died had elevated levels of alanine transaminase (ALT), aspartate aminotransferase (AST), and gamma-glutamyl transferase (GGT), as well as mildly elevated levels of overall bilirubin, as opposed to patients in wards or those who survived - results that matched the findings of other tests. In patients admitted to the ICU, elevated levels of inflammatory markers such as C-reactive protein (CRP), lactate dehydrogenase (LDH), D-dimer, erythrocyte sedimentation rate (ESR), ferritin, and procalcitonin (PCT) were found, with findings correlating with multiple reports.18,19

Our research had a few drawbacks, including a smaller sample size than previous Chinese studies and a retrospective analysis, which indicates that not all laboratory parameters were consistently monitored in every patient. Another drawback is that the only radiological investigation used was a chest radiograph, with no CT scan done to validate the radiological result, as further screening tests for Covid-19 have been proposed. Finally, follow-up labs were not readily accessible for all patients, including those who were sent home for isolation.20-23

CONCLUSION

A single-centre analysis of 50 COVID-19 positive hospitalized patients in a developing world found a variety of factors related to disease incidence and mortality, as well as complex improvements in laboratory investigations during hospitalization that influenced prognosis. While several broad center prospective surveys are required to investigate the results demonstrated, the clinical history and characteristics of patients, as well as comparing levels of many biomarkers, can be used to forecast disease incidence and mortality. Several indicators, such as elevated leukocyte and CRP, LDH, and deranged urea/creatinine, were identified to be most likely correlated factors with disease incidence and mortality in our study. so are lower bicarbonate levels. However, acute liver and kidney injury are more common in COVID-19 patients.

The literature considers the deranged values of liver function enzymes in Covid-19 to be of less concern, while our study shows a connection between liver enzymes and the increased number of ICU admissions as well as prognostic markers, necessitating further research in this area to document the derangements of liver enzymes during hospitalization and their relationship to clinical outcomes.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

1. WHO.WORLD HEALTH ORGANIZATION; GENEVA: 2020. CORONAVIRUS DISEASE (COVID-19) pandemic.https://www.who.int/emergencies/diseases/novel-coronavirus-2019.
2. Rakesh Kumar Jha, Pradip Jain, Ranjit S. Ambad, Nandkishor. The Origin, Transmission and Mortality of Corona Virus. JCR. 2020; 7(10): 93-96. doi:10.31838/jcr.07.10.23.
3. Environmental effects of COVID-19 pandemic and potential strategies of sustainability. Tanjena Rumea and S.M. Didar-Ul Islamb .Heliyon. 2020 Sep; 6(9): e04965.
4. Buran, T., Sanem Gökçe Merve Kılınç, & Elmas Kasap. (2020). Prevalence of Extraintestinal Manifestations of Ulcerative Colitis Patients in Turkey: Community-Based Monocentric Observational Study. *Clinical Medicine and Medical Research*, *1*(2), 39-46. https://doi.org/10.52845/CMMR/2020v1i2a8
5. Lokhandwala S, Gautam P. Indirect impact of COVID-19 on environment: A brief study in Indian context. Environ Res.2020;188:109807.doi:10.1016/j.envres.2020.109807.
6. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Napoli RD. In: StatPearls [Internet]. Vol. 2020. Treasure Island, FL: StatPearls Publishing; 2020. Features, Evaluation and Treatment Coronavirus (COVID-19) pp. 1–10.
7. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia.Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung KSM, Lau EHY, Wong JY, Xing X, Xiang N, Wu Y, Li C, Chen Q, Li D, Liu T, Zhao J, Liu M, Tu W, Chen C, Jin L, Yang R, Wang Q, Zhou S, Wang R, Liu H, Luo Y, Liu Y, Shao G, Li H, Tao Z, Yang Y, Deng Z, Liu B, Ma Z, Zhang Y, Shi G, Lam TTY, Wu JT, Gao GF, Cowling BJ, Yang B, Leung GM, Feng ZN Engl J Med. 2020 Mar 26; 382(13):1199-1207.
8. Daniel, V. ., & Daniel, K. (2020). Diabetic neuropathy: new perspectives on early diagnosis and treatments. *Journal of Current Diabetes Reports*, *1*(1), 12–14. https://doi.org/10.52845/JCDR/2020v1i1a3
9. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection?Fang L, Karakiulakis G, Roth MLancet Respir Med. 2020 Apr; 8(4):e21.
10. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Napoli RD. In: StatPearls [Internet]. Vol. 2020. Treasure Island, FL: StatPearls Publishing; 2020. Features, Evaluation and Treatment Coronavirus (COVID-19) pp. 1–10.

11. Daniel, V., & Daniel, K. (2020). Perception of Nurses' Work in Psychiatric Clinic. *Clinical Medicine Insights*, *1*(1), 27-33. https://doi.org/10.52845/CMI/2020v1i1a5

12. Traditional Chinese Medicine in the Treatment of Patients Infected with 2019-New Coronavirus (SARS-CoV-2): A Review and Perspective.Yang Y, Islam MS, Wang J, Li Y, Chen XInt J Biol Sci. 2020; 16(10):1708-1717.

13. Asghar MS, Haider Kazmi SJ, Ahmed Khan N, et al. Clinical Profiles, Characteristics, and Outcomes of the First 100 Admitted COVID-19 Patients in Pakistan: A Single-Center Retrospective Study in a Tertiary Care Hospital of Karachi [published correction appears in Cureus. 2020 Aug 6;12(8):c34]. Cureus. 2020;12(6):e8712. Published 2020 Jun 20. doi:10.7759/cureus.8712.

14. Chai X, Hu L, Zhang Y, Han W, Lu Z, Ke A, et al. Specific ACE2 expression incholangiocytes may cause liver damage after 2019-nCoV infection. bio-Rxiv 2020.

15. Daniel, V., & Daniel, K. (2020). Exercises training program: It's Effect on Muscle strength and Activity of daily living among elderly people. *Nursing and Midwifery*, *1*(01), 19-23. https://doi.org/10.52845/NM/2020v1i1a5

16. MacLaren G., Fisher D., Brodie D. Preparing for the most critically ill patients withCOVID-19: the potential role of extracorporeal membrane oxygenation. JAMA. 2020doi: 10.1001/jama.2020.2342. Published online February 19, 2020.

17. Zhang W. Imaging changes of severe COVID-19 pneumonia in advanced stage.Intensive Care Med. 2020:1–3.

18. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China.Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y, Li Y, Wang X, Peng ZJAMA. 2020 Mar 17; 323(11):1061-1069.

19. Neutrophil-to-lymphocyte ratio as an independent risk factor for mortality in hospitalized patients with COVID-19.Liu Y, Du X, Chen J, Jin Y, Peng L, Wang HHX, Luo M, Chen L, Zhao YJ Infect. 2020 Jul; 81(1):e6-e12.

20. Longitudinal characteristics of lymphocyte responses and cytokine profiles in the peripheral blood of SARS-CoV-2 infected patients.Liu J, Li S, Liu J, Liang B, Wang X, Wang H, Li W, Tong Q, Yi J, Zhao L, Xiong L, Guo C, Tian J, Luo J, Yao J, Pang R, Shen H, Peng C, Liu T, Zhang Q, Wu J, Xu L, Lu S, Wang B, Weng Z, Han C, Zhu H, Zhou R, Zhou H, Chen X, Ye P, Zhu B, Wang L, Zhou W, He S, He Y, Jie S, Wei P, Zhang J, Lu Y, Wang W, Zhang L, Li L, Zhou F, Wang J, Dittmer U, Lu M, Hu Y, Yang D, Zheng XEBioMedicine. 2020 May; 55():102763.

21. Laboratory Parameters in Detection of COVID-19 Patients with Positive RT-PCR; a Diagnostic Accuracy Study.Mardani R, Ahmadi Vasmehjani A, Zali F, Gholami A, Mousavi Nasab SD, Kaghazian H, Kaviani M, Ahmadi NArch Acad Emerg Med. 2020; 8(1):e43.

22. Evaluation of hepatic enzymes changes and association with prognosis in COVID-19 patients. Nava VO, Maleki I, Ahmadi A, et al. Hepat Mon. 2020;20:0.

23. Liver injury during highly pathogenic human coronavirus infections.Xu L, Liu J, Lu M, Yang D, Zheng XLiver Int. 2020 May; 40(5):998-1004.

24. Gangaram Bhadarge, Nandkishor Bankar , Saurabh Hadke, Study of Liver Function Test, Haematological Parameters and Crp Derangements in Covid-19 Patients, Biosc.Biotech.Res.Comm. Special Issue Vol 14 No 06 (2021) Pp-36-40